Background

Parliamentary Elections for 2001, previously scheduled for January 17 were postponed until March 19. As we enter February, Guayana Electoral Commission (GECOM) seems to be on track to conduct elections on this date. IFES has provided a team of technical advisors to assist in the planning for these elections; this report focuses on that assistance in the area of Information Technology.

In response to allegations of widespread inaccuracies and possible fraud in the handling of the voters list, GECOM formed a Database Integrity Test Committee (DITC) composed of representatives from political parties, civil society, and the international community. This group was charged with the task of conducting such tests of the database as could be performed in a secure environment, examining the data itself. The DITC conducted numerous tests and pronounced that the data had not been tampered with between the 1997 election and the time of the tests, but that their methodology was not able to pronounce on any correspondence between the data and actual voters. A subsequent field test was planned, but after much debate over the methodology for this test and for appropriate responses to any results obtained by the test, the parties reached a compromise that obviated much of the need for the field-testing. According to the terms of the compromise, all voters were required to appear at one of the registration centers established throughout the country, to reaffirm the accuracy of the data in their record or to correct it, and to have a photo taken for production of a national ID card.

In late January the courts, responding to a suit brought by the People's National Congress (PNC) Party concerning the 1997 election, found that any requirement placed upon voters to have an ID card was unconstitutional. In the words of Justice Claudette Singh": "This act introduces the concept of 'no card no vote'; that is, it made it compulsory for a person to have a voter's identification card in order to vote. It would follow therefore that the constitutional right to vote would be denied to any person who did not produce such a card . . . with the introduction of the voter's identification card a person may be registered and still not be able to vote."

The revised GECOM position with regard to the voters' list and ID card is that the sole determining factor that defines eligibility to vote for 2001 is the appearance of the elector's name on the voters' list. (In order to appear on the voters' list, a person must meet the constitutional requirements for eligibility.) If the voter has a national ID card, this can be used to substantiate that s/he is the person whose name appears on the list. In the absence of such an ID card, the voter will be required to show other proof of identity.

Information Systems Timeline

GECOM Information Systems Department (ISD) has processed all data from the Claims and Objections period, and has printed the Revised Voter List (RVL). The RVL is required by law to be displayed for 21 days to allow voters to confirm that changes submitted during the Claims and Objections period are reflected on the list.

ISD is now producing National ID cards, and it is estimated that this printing will be completed by the end of February.

A number of system development tasks remain to be completed before Election Day, including:

- Logistics Tracking Database
- Preliminary Results Reporting Database
- Statement of Polls Processing System
- Seat Allocation Programming
- Results Publication System

These systems are detailed in the remainder of this report.

Logistics Tracking Database

Reporting Structure / Information Flow Diagram

Please refer to the "Reporting Structure Diagram" in the Appendix to this report. This communication plan will be used for reporting distribution of all materials, Polling Station status, Progress of Voting (Voter Turnout), and Preliminary Results.

1. Presiding Officer (PO) reports via Telephone, Radio or Fax to the Deputy Returning Officer (DRO). DRO logs receipt of report, and gives "Acknowledgment Number" (ACK) to PO. This ACK is a number printed on the Log at the Sub District Office, and serves as a confirmation number that can be used as evidence that the PO has submitted his report.

2. DRO periodically checks status of all Polling Stations. If any Polling Station has missed a deadline for reporting, DRO initiates contact with PO. (This is indicated on the diagram as NAK, indicating No Acknowledgment.) PO responds either by giving report or explaining reason for delay. DRO logs this conversation and any reasons given for delay.

3. When all Polling Stations in a Batch have reported, DRO reports via Telephone, Radio or Fax to the Returning Officer (RO). RO logs receipt of report, and gives ACK to DRO. (Polling Stations Batches are explained below.)

4. RO periodically checks status of all Sub District Offices. If any Sub District Office has missed a deadline for reporting, RO initiates contact with DRO. DRO responds either by giving report or explaining reason for delay. RO logs this conversation and any reasons given for delay.

5. RO submits Batch report to CEO via Radio, then sends FAX of same. CEO logs receipt of report, and gives ACK to RO.

6. CEO periodically checks status of all District Offices. If any District Office has missed a deadline for reporting, CEO initiates contact with RO. RO responds either by giving report or explaining reason for delay. CEO logs this conversation and any reasons for delay.

Polling Station Batches

Polling Stations will be grouped into Batches for the purpose of reporting. This grouping will reduce the amount of information that must be communicated DRO to RO, and RO to CEO, and will also simplify the data entry requirements.

Each DRO should divide the Polling Stations in his Sub District into Batches, with each Batch representing at least 3 and no more than 8 Polling Stations, with the optimum Batch size being 5 Polling Stations. Each Batch should include Polling Stations that are expected to report in approximately the same timeframe. For example, if a Sub District has 8 Polling Stations located fairly near to the Sub District Office, and 6 Polling Stations located much farther away, the DRO might define 3 Batches. Batch 1 might include the 4 smallest Polling Stations near to the Sub District Office since these 4 are likely the first that will report polling results. Batch 2 would then include the 4 other Polling Stations near the Sub District Office, and Batch 3 would include the 6 Polling Stations farthest away.

The DRO will complete a Batch Definition form and will submit this to the RO before Nomination Day. GECOM Information System Department will use this definition to pre-print Batch Report Forms as follows:

- Materials Distribution Report
- ID Card Distribution Report
- Polling Station Status Report
- Progress of Voting Report
- Preliminary Results Report
- Statement of Polls Delivery Report

Advantage of Batch Reporting

As previously stated, the primary advantage of Batch Reporting is that it reduces the amount of information that must be communicated in each conversation between DRO and RO, and between RO and CEO. A description of Preliminary Results reporting will clarify this advantage.

A sample form for Preliminary Results reporting will be similar to the following example:

Preliminary Results Report – Polling District # 1, Sub District # 1 Batch 1				
	111112	111113	111123	111127
Political Party 1	128	119	103	92
Political Party 2	96	101	81	68
Political Party 3	93	99	72	40
Political Party 4	62	34	48	28
Submitted (Date / Time)	_____			
Acknowledgment #	_____			

When the DRO contacts the RO, he begins by identifying the Batch Number for which he is reporting. The RO selects the correct form for the corresponding batch.

The DRO then reads off, "PS1 – 128 – 96 – 93 – 62", and the RO repeats this phrase. The DRO continues, "PS2 – 119 – 101 – 99 – 34", and the RO repeats. This continues until Preliminary Results have been reported for all Polling Stations.

By pre-printing Preliminary Results Batch Report forms, we eliminate the necessity for the DRO and RO to mention Polling Station Names and Political Party Names. When the DRO identifies that he is reporting on Batch # 1, and the RO can have in front of him a form identical to the form from with the DRO is reading the results information. The only information that must be passed over radio or telephone is the Batch Number, the Polling Station Number, and the numbers recorded in each row of that column.

Report Forms Required

To assist with the reporting of information from PO, through DRO and RO, to the CEO, the following forms will be pre-printed:

LOG Charts – Sub District Office	There will be a chart for each type of report (Materials Distribution, ID Card Distribution, Polling Station Status, Progress of Voting, Preliminary Results, SOP Delivery). This chart will be hung on the wall of the Sub District Office, and will be used to track reports from the Polling Stations.
Communication Log – PO, DRO, RO, CEO	This will be used to record date/time and any comments related to every report from PO to DRO, DRO to RO, and RO to CEO.
Batch Definition	The DRO will complete this as soon as possible to be used by GECOM ISD in pre-printing all batch reporting forms.
Materials Distribution	Batch form completed by DRO to record when each Polling Station confirms receipt of materials. When each Polling Station in a Batch has reported, DRO will relay this information to RO.
ID Card Distribution	Completed by DRO to record when each Polling Station confirms receipt of ID Cards. When each Polling Station in a Batch has reported, DRO will relay this information to RO.
Polling Station Status	Completed by DRO to record Readiness Status of each Polling Station. (Contracted, Security Arranged, Keys Available, PO appointed, etc.)
Progress of Voting	Completed by DRO at regular intervals to indicate the number of voters who have cast ballots at each Polling Station. . When each Polling Station in a Batch has reported, DRO will relay this information to RO.
Preliminary Results	Completed by DRO to record preliminary results information reported by each Polling Station. . When each Polling Station in a Batch has reported, DRO will relay this information to RO.
Statement of Polls Delivery	Completed by DRO to indicate receipt of Statement of Polls from each Polling Station. . When each Polling Station in a Batch has reported, DRO will relay this information to RO.

Preliminary Results Reporting Database / Statement of Polls Processing

Three types of information arrive from the Polling Station.

Unofficial Results	Information on the vote count. This information may be phoned, faxed, radioed, or delivered on paper. The information includes Polling Station ID, Party and Number of Votes for each party receiving votes at that Polling Station, and Total Number of Votes cast for all parties at that Polling Station. If the information is phoned or radioed, the recipient will complete an Unofficial Results form.
Statement of Polls – Results of Voting	This is the official vote count, signed by the presiding officer at the Polling Station and by all party agents / observers.
Statement of Polls - Ballot Accounting Form	Summarizes ballot usage, and should reconcile with the Statement of Polls. Information includes Total Ballots Received, Number of Signatures on all Registers, Total Valid Votes cast (should match the Statement of Polls), Total Spoilt Ballots (those recognized as having a problem before the vote is cast), and Invalid Votes cast (under-votes, over-votes, votes that are marked in a way that violates law.

To improve the accuracy and legibility of the Statement of Polls, it is desirable for GECOM Information Systems Department (ISD) to pre-print these with the Polling Station ID and Name, and with all Political Party IDs and names. This would ensure that no parties are inadvertently omitted during completion of the form, that the party names are legible, and that they are in the same order as they appear on the ballot.

The Statement of Polls should also be pre-printed with a barcode reflecting the Polling Station ID. The barcode will sped up tracking of forms as they are received, entered, and filed. The barcode will also serve as a link between the photo-image and the data (described later in this paper).

When each piece of information arrives at the counting center a clerk should immediately log receipt of the information showing the type of form (Unofficial Results / Statement of Polls / Ballot Accounting), and the date / time received. This information will be stored in the results database and used to generate tracking reports.

After logging, the Statement of Polls is passed to a scanner operator who will scan the form, creating a JPEG image. A computer program will decode the barcode contained in the image, and will rename the image file with the Polling Station ID stored in the barcode. The images will be stored in a subdirectory on the database server where they will be used data entry and for publishing final results.

After scanning, the form will be delivered to a file clerk who will log the date/time the form was received and file it with all other forms in order of Form Type and Polling Station ID.

Data entry operators will type the information into the computer from the scanned image (see *Data Entry* below).

Finally, the form will be delivered to a file clerk who will log the date/time the form was received and file it with all other forms in order of Form Type and Polling Station ID.

Data Entry

The data entry program will be designed to allow operators to view an image of the Statement of Polls form onscreen. This will provide two significant benefits. First, it reduces the requirement for tracking the flow of paper to ensure that no form is lost, and that no time is wasted re-entering forms that have already been processed. Second, the data entry operator can keep his/her eyes on the computer screen. As the operator moves through the form, the graphic image of the handwritten form will be automatically repositioned so that the relevant part of the form is visible in the window.

A data entry operator will enter data using this program, and the data will be stored in a temporary database table. A second data entry operator will re-enter the data. The computer program will compare the data from the two operators. If there is a match, the data will be stored in the appropriate database. If there is any mismatch, the data will be stored in another row in the temporary database table, and the third data-entry operator will enter the data. When the data is entered the third time, this data will be compared with both of the previous rows of data. If there is a perfect match with either row, the data will be moved from the temporary database into the appropriate table of the results database. If the data does not match either of the rows of data entered earlier, the newly entered data will be stored in another row of the temporary database and the form will be passed to a supervisor to resolve the differences.

Reports

The system will generate a number of reports both for tracking the progress of the official vote count and for publishing the final results. Tracking reports will include:

Polling Stations Status Report	Shows a list of all Polling Stations, ordered by District and Polling Station ID, and date/time for each form received. A row of hyphens will be printed in lieu of date/time for any form that has not been received.
Missing Unofficial Results Report Missing Statement of Polls Report Missing Ballot Accounting Report	These reports will show a list, ordered by District and Polling Station, of all outstanding forms. This will be most useful late in the reporting process when there are only a few Polling Stations who have not submitted any given form. For example, if Unofficial Results have been received from all but 50 Polling Stations, this would give Election Operations a quick snapshot of which 50 Polling Stations are still outstanding.
Information Flow Timing	Ordered by date/time received, this will show every form received. This will be useful for future analysis of peak demand, and for diagnosing any bottlenecks in the flow of information.

Results Publication Reports will include:

Vote Tabulation Summary	The number of votes per party, broken down by District, with National totals.
Vote Tabulation Detail	A listing of very Polling Station, and the number of votes per party, with District subtotals, and National totals.
Polling Station Detail	This report will show results for a single Polling Station, including Results Data, Ballot Accounting Data, and photo image of the Statement of Polls.

A CD-ROM will be produced including all Results Publication Reports, and Polling Station Status Report.

Seat Allocation Programming

While the results database was not yet built in late January, the following Entity Relationship Diagram is an attempt to approximate the structure that will store the vote count information.
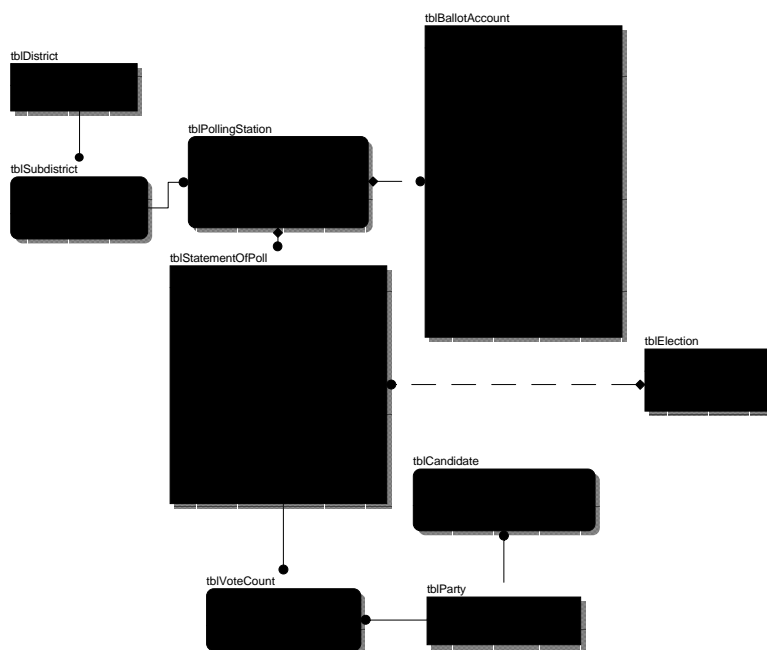
Entity Name	Entity Attribute Column Name	Description
BallotAccount	BallotAccountID	Serial number identifying the ballot accounting worksheet (Same as StatementID)
	DistrictID	
	SubdistrictID	
	PS_ID	Polling Station Number
	BallotBoxNumber	
	PollingDistrict	
	PollingPlace	
	NumberBallotsRecd	Number of ballots received
	StartSerial	Starting serial number in package(s) of ballots received
	EndSerial	Ending serial number in package(s) of ballots received
	NumberInBallotBox	Number of ballots in ballot box
	DittoUnused	Number of ballots unused
	DittoSpoilt	Number of ballots spoilt
	NumberTenderedRecd	Number of tendered ballots received
	TenderStartSerial	Starting serial #of tendered ballots
	TenderEndSerial	Ending serial # of tendered ballots
	NumberTenderedInBox	Number of tendered ballots in box
	TenderedUnused	Number of unused tendered ballots
	TenderedSpoilt	Number of spoilt tendered ballots
	DateOfStatement	
StatementOfPoll	StatementID	Serial number identifying the Statement of Poll (same as BallotAccountID)
	DistrictID	
	SubdistrictID	
	PS_ID	
	ElectionID	Unique number assigned to identify which election this Statement is for
	NumberValidVotes	
	NumberSpoilt	
	NumberDestroyed	
	NumberTendered	
	NumberMissingOfficialMark	
	NumberUnmarked	
	NumberDoubleMarked	
	NumberElectorIdentified	
	NumberTotalReject	
	DateOfStatement	DateOfStatement
		PrelimOrFinal
		DatetimeReceived
tblCandidate	CandidateID	Unique serial number identifying a candidate
	PartyID	
	CandidateName	
tblDistrict	DistrictID	Unique serial number identifying a district
	Name	
tblElection	ElectionID	Unique serial number identifying a particular election
	ElectionDate	
	Level	{ National, District, Local }
tblParty	PartyID	Unique serial number identifying a particular party
	PartyName	
tblPollingStation	DistrictID	
	SubdistrictID	
	PS_ID	Unique serial number identifying a specific polling station
	Name	
	PresidingOfficer	
tblSubdistrict	DistrictID	Unique serial number identifying a district
	SubdistrictID	
	Name	
VoteCount	StatementID	StatementID that is source for this vote tally
	PartyID	PartyID of the party receiving # votes
	NumberOfVotes	Number of votes received by the party

The allocation begins by collating all votes for each Party by District into a table similar to the following:

District	# of seats	Party A	Party B	Party C	Party D	Total Votes	Threshold (total votes / seats)
1	2	3,000	1,000	800	100	4,900	2,450
2	2	6,000	2,000	1,500	80	9,580	4,790
3	3	25,000	20,000	10,000	20	55,020	18,340
4	7	60,000	50,000	40,000	120	150,120	21,446
5	2	12,000	11,000	8,000	295	31,295	15,648
6	3	25,000	28,000	6,000	60	59,060	19,687
7	2	5,500	3,800	800	200	10,300	5,150
8	1	1,000	1,000	950	1,050	4,000	4,000
9	1	3,000	1,500	800	200	5,500	5,500
10	2	12,000	4,000	2,500	200	18,700	9,350
Total	25	152,500	122,300	71,350	2,325	348,475	

Once this table is created, the allocation proceeds as described in Appendix F – HARE Allocation Formula.

Recommendations

There is an immediate need for database programming support from someone with election experience, specifically in the areas of vote count and seat allocation. It is recommended that IFES provide someone for a period of approximately 6 weeks. The primary role of this person would be as advisor / troubleshooter. GECOM ISD staff should do the bulk of development, but when they run into any significant technological barriers the advisor could cut days off the development process.

In the focus on preparing for March 19, 2001 elections, we should not lose sight of a longer-range goal. For the first time, Guyana has a permanent electoral commission staff. Up to this point every election, including the current one, has been a process of "re-creating the wheel". New staff creates new procedures, new forms, new training materials, new computer programs, etc. Many of the problems with the 1997 election, and with the planning for the 2001 election could have been avoided by longer-term planning, staff development, and institutionalization of procedures and programs. Soon after the results of the current election are announced it would be beneficial to GECOM and to the donor community to have an evaluation workshop, and to develop a set of "lessons learned". These should serve as a springboard to creation of a "Policies and Procedures" manual for GECOM. Although this manual will not solve every problem, it will provide a framework for development of institutional memory.

In the Information Systems Department, an audit should be completed of all existing systems, and ISD should immediately begin design of an integrated system that allows re-use of these components.

Appendix A – Reporting Structure Diagram
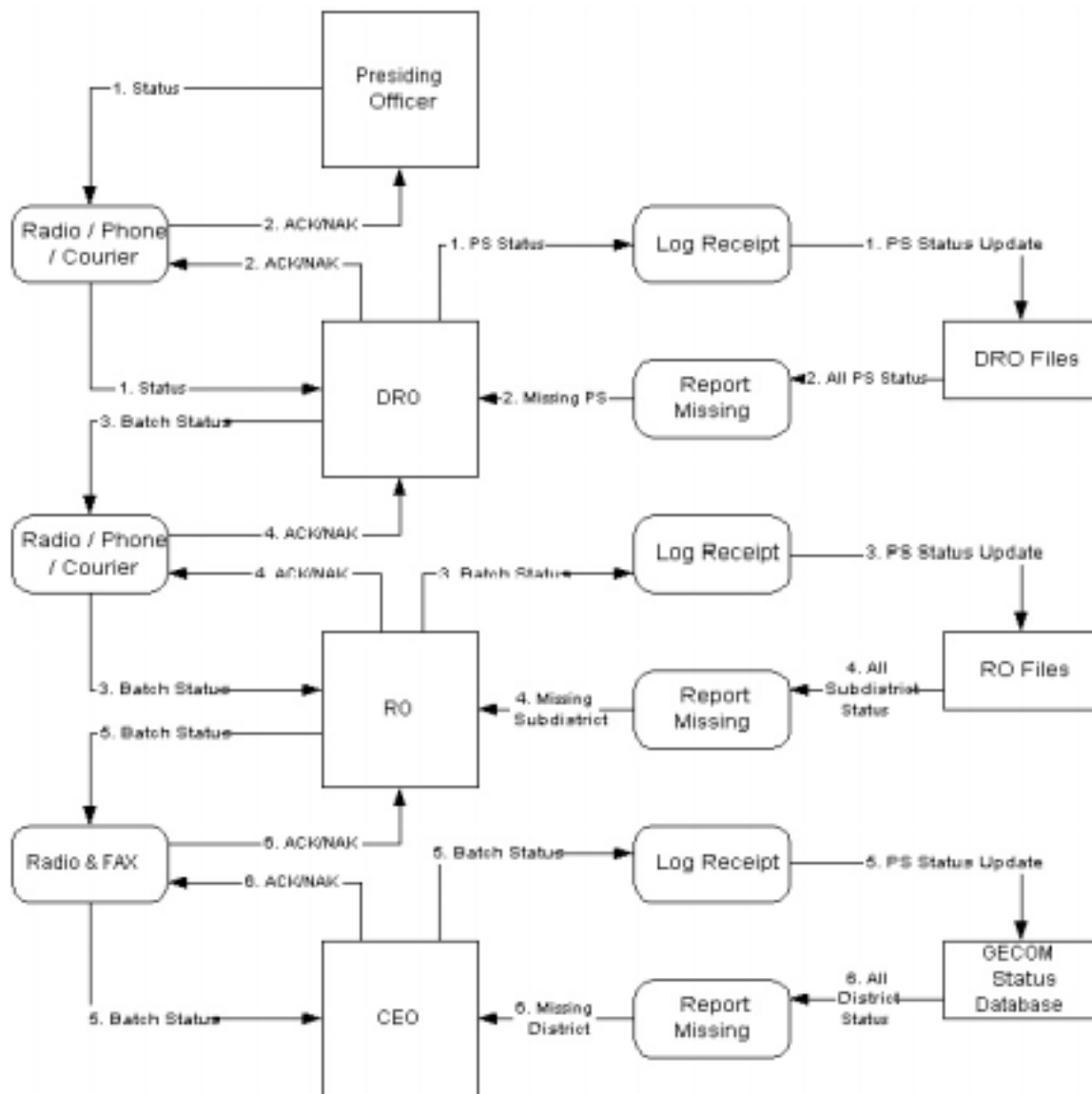
Appendix B – Results Data Flow Diagram
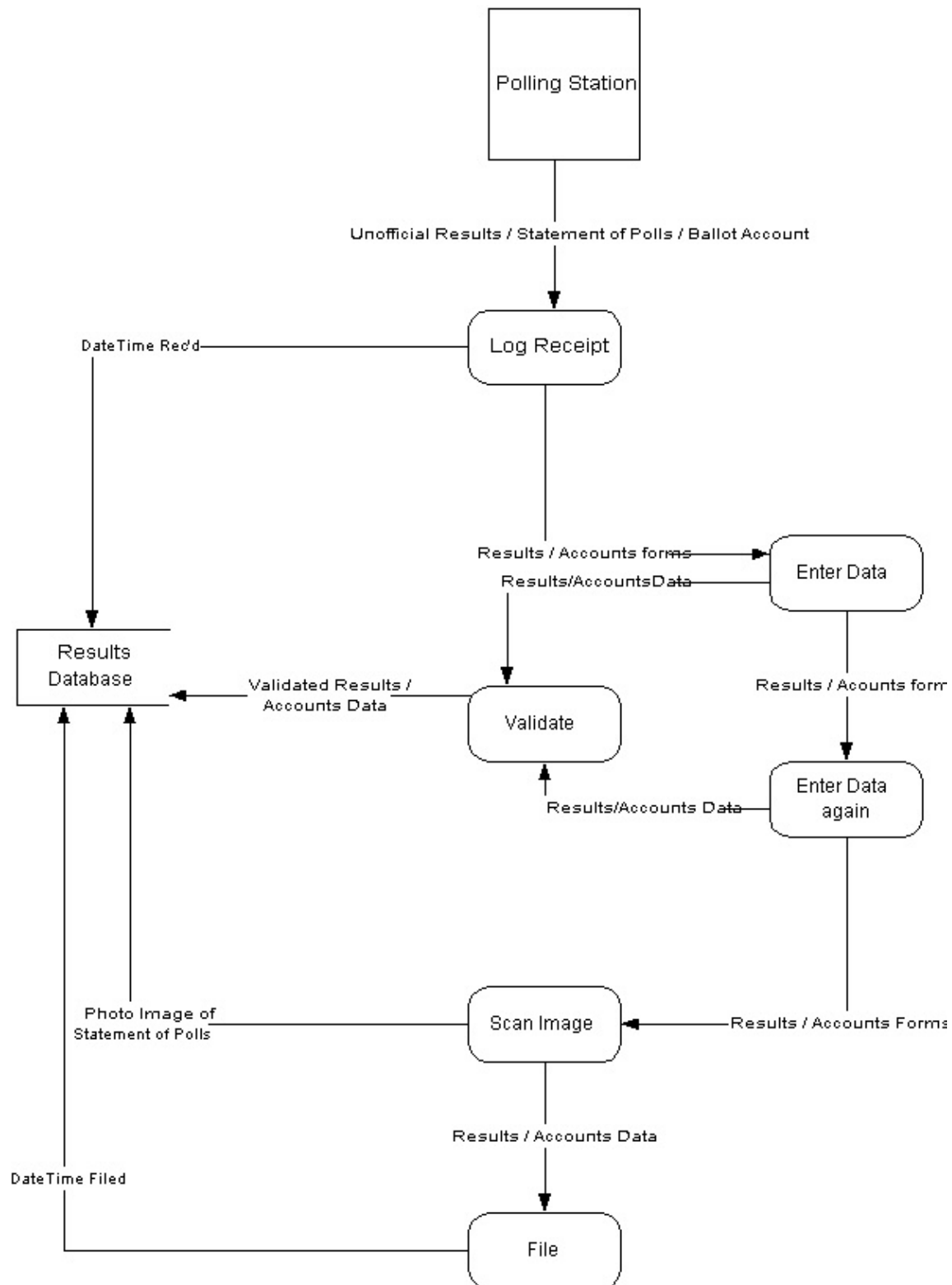
Appendix C – Terms of Reference – IT Technical Advisor

As Guyana Election Commission (GECOM) prepares for March 19, 2001 elections, there is a need for a number of database development projects. For the past several months, the emphasis of the Information Systems Department has been the production of the Voters List and Voter ID Cards. With 6 weeks remaining before Election Day, there is a need for development of the following systems:

- Logistics Tracking Database
- Preliminary Results Reporting Database
- Statement of Polls Processing System
- Seat Allocation Programming
- Results Publication System

An Information Technology Technical Assistant is required to provide support for GECOM in the development of these systems, assisting with any technological hurdles they may encounter, testing the completed systems, and providing any other assistance requested by the Technology Oversight Committee or the Chief Technical Advisor.

The IT Technical Assistant should have experience in developing election results systems, using Microsoft SQL Server, Access 2000, and Visual Basic.

Appendix D – Printing Specifications for Statement of Polls Serial Number and Barcode

Forms should be serially numbered, and the serial number should include a mathematical check-digit, using Modulus 11. GECOM can provide a Visual Basic program for generating these numbers, or can provide vendor with a list of numbers in electronic form.

There should be 16 copies of the form for each serial number. All 16 forms with matching serial number should be stacked together. To clarify, upon opening a pack of forms, the top 16 forms should have the same serial number, and the next 16 forms should have the same serial number, etc.

A standard "3 of 9" barcode with a height of not less than .25" should be printed above the serial number on each form. GECOM can provide a TrueType Font that can be used to print this barcode, or vendor can use any technique of their choosing to generate and print the barcode.

Routines for Handling MOD 11 Check Digit

```
Function CheckDigitOK(strNum As String) As Boolean
' ----- this routine receives a numeric string that includes a check digit as the last digit
'        in the number, and returns a True or False indicating on whether the
'        check digit is accurate

   Dim intMultiplier As Integer
   Dim intSum As Integer
   Dim intCheckDigit As Integer
   Dim intCalculatedCheck As Integer

   intCheckDigit = Val(Right$(strNum, 1))

   intMultiplier = 7
   For x = 1 To Len(strNum) - 1
      intSum = intSum + (Val(Mid$(strNum, x, 1)) * intMultiplier)
      If intMultiplier = 2 Then
         intMultiplier = 7
      Else
         intMultiplier = intMultiplier - 1
      End If
   Next

   intCalculatedCheck = 11 - (intSum Mod 11)
```

```
   If intCalculatedCheck = 11 Then intCalculatedCheck = 0

   If intCalculatedCheck = intCheckDigit Then
      CheckDigitOK = True
   Else
      CheckDigitOK = False
   End If
End Function

Function CheckDigit(strNum As String) As Integer
' ----- this routine receives a numeric string and returns the appropriate check digit

   Dim intMultiplier As Integer
   Dim intSum As Integer
   Dim intCalculatedCheck As Integer

   intMultiplier = 7
   For x = 1 To Len(strNum)
      intSum = intSum + (Val(Mid$(strNum, x, 1)) * intMultiplier)
      If intMultiplier = 2 Then
         intMultiplier = 7
      Else
         intMultiplier = intMultiplier - 1
      End If
   Next

   intCalculatedCheck = 11 - (intSum Mod 11)
   If intCalculatedCheck = 11 Then intCalculatedCheck = 0

   CheckDigit = intCalculatedCheck
End Function
```

Appendix E – Sample Forms

Forms Needed

Form Type	Date Needed	Date to be Used	
Batch Definition			The DRO will complete this as soon as possible to be used by GECOM ISD in pre-printing all batch reporting forms.
LOG Charts – Sub District Office			There will be a chart for each type of report (Materials Distribution, ID Card Distribution, Polling Station Status, Progress of Voting, Preliminary Results, SOP Delivery). This chart will be hung on the wall of the Sub District Office, and will be used to track reports from the Polling Stations.
Communication Log – PO, DRO, RO, CEO			This will be used to record date/time and any comments related to every report from PO to DRO, DRO to RO, and RO to CEO.
Non Sensitive Materials Distribution		6 Mar	Batch form completed by DRO to record when each Polling Station confirms receipt of materials. When each Polling Station in a Batch has reported, DRO will relay this information to RO.
Sensitive Materials Distribution		12 Mar	Batch form completed by DRO to record when each Polling Station confirms receipt of materials. When each Polling Station in a Batch has reported, DRO will relay this information to RO.
ID Card Distribution			Completed by DRO to record when each Polling Station confirms receipt of ID Cards. When each Polling Station in a Batch has reported, DRO will relay this information to RO.
Polling Station Status / Progress of Voting			Completed by DRO to record Readiness Status of each Polling Station, and to indicate the number of voters who have cast ballots at regular intervals. When each Polling Station in a Batch has reported, DRO will relay this information to RO.
Preliminary Results			Completed by DRO to record preliminary results information reported by each Polling Station. . When each Polling Station in a Batch has reported, DRO will relay this information to RO.
Statement of Polls Delivery			Completed by DRO to indicate receipt of Statement of Polls from each Polling Station. . When each Polling Station in a Batch has reported, DRO will relay this information to RO.

Batch Definition Report – SAMPLE
To be completed by each DRO and returned before Nomination Day

Polling District _____

Sub District _____

Please group all Polling Stations in your subdistrict into batches. Each batch should include Polling Stations who you anticipate will report to you in roughly the same timeframe. The ideal batch size if 5 Polling Stations, and each Batch should have at least 3 and no more than 8 Polling Stations.

	Batch 1	Batch 2	Batch 3	Batch 4	Batch 5	Batch 6	Batch 7	Batch 8
Enter Polling Station Numbers in the appropriate column. Each Column will represent one batch.								

Deputy Returning Officer _____
                    Signature

Please print name _____

Communication Log

Enter District, Subdistrict, Polling Station _____

Name of PO, DRO, RO, or CEO _____

Enter a brief record of every official report to/from your supervisor or subordinate:

Date	Time	Contact	Comments

DRO Log Chart – SAMPLE FOR MATERIAL DISTRIBUTION
(similar wall-size chart for Sensitive Materials, Non-sensitive Materials, ID Cards)

Polling District # 1, Sub District # 1

Check the appropriate box as each Polling Station reports receipt of materials:

NON SENSITIVE MATERIALS RECEIVED:

Batch # 1		Batch # 2		Batch # 3		Batch # 4	
111123A	☐	111112	☐	111114	☐	111115	☐
111123B	☐	111113	☐	111120	☐	111116	☐
111118	☐	111119	☐	111117	☐	111121	☐
111126	☐	111115	☐	111124	☐	111122	☐
111127	☐	111128	☐				

Polling Station Status
Polling District # 1, Sub District # 1
Batch # 1

	111112	111113	111123	111127
Ready (Day before Election. Staff on hand. Keys available. All supplies received.				
Polls Open (report approx. # of people waiting in queue at opening)				
Voter turnout – by Noon				
Voter turnout – 3:00 PM				

SENSITIVE MATERIALS DISTRIBUTION REPORT – SAMPLE
Polling District # 1, Sub District # 1
Batch # 1

Regular Ballots	111112	111113	111123	111127
Tendered Ballots				
Tendered Ballot Envelopes				
Military Voting Envelopes				
Ballot Box				
FVL				
MRC copies				
Reporting Forms (detailed list needed)				
Voting Screens (2 ea)				
Indelible Ink				

Preliminary Results Report – SAMPLE Polling District # 1, Sub District # 1 Batch 1				
	111112	111113	111123	111127
Political Party 1	128	119	103	92
Political Party 2	96	101	81	68
Political Party 3	93	99	72	40
Political Party 4	62	34	48	28
Submitted (Date / Time)	_____			
Acknowledgment #	_____			

APPENDIX F - HARE Formula Overview

The allocation of National Assembly seats is done by the Hare (Largest Remainders) formula. To apply this formula, we must first determine a Threshold by dividing the total number of votes by the number of seats to allocate, rounded up to the nearest whole number. As an example, we will take a hypothetical election with the following votes:

Seats to Allocate	65
# Votes for Party A	152,500
# Votes for Party B	122,300
# Votes for Party C	71,350
# Votes for Party D	2,325
Total Votes	348,475
Threshold (Total Votes / Seats)	5,362

The number of seats allocated to each party is determined by doing an "integer divide" of the Votes for Party by the Threshold. Integer division disregards the fractional remainder of dividing. We will use the fractional remainder in a following step. In our example, the integer division gives us the following allocation:

Party	# of Seats Allocated by Integer Division	Fractional Remainder
Party A (152,500 / 5,362)	28	.440880269
Party B (122,300 / 5,362)	22	.808653488
Party C (71,350 / 5,362)	13	.306602014
Party D (2,325 / 5,362)	0	.433606863

At this point we have allocated 63 of the 65 available seats. The remaining seats are allocated on the basis of highest fractional remainders. In this case, one seat goes to Party B, and one seat to Party A.

Allocation of Geographical Constituency Seats

According to Guyana Election Law (Act No. 15), a total of 25 seats will be elected based upon the votes within each of the 10 geographical constituencies. The law describes the number of seats for each constituency. The process is illustrated below using sample numbers of votes, and applying the Hare formula. The following table gives all relevant details for each constituency, including the number of seats to allocate, number of votes for each party, total number of votes, and Threshold.

Vote Count

Geo District	# of seats	Party A	Party B	Party C	Party D	Total Votes	Threshold (total votes / seats)
1	2	3,000	1,000	800	100	4,900	**2,450**
2	2	6,000	2,000	1,500	80	9,580	**4,790**
3	3	25,000	20,000	10,000	20	55,020	**18,340**
4	7	60,000	50,000	40,000	120	150,120	**21,446**
5	2	12,000	11,000	8,000	295	31,295	**15,648**
6	3	25,000	28,000	6,000	60	59,060	**19,687**
7	2	5,500	3,800	800	200	10,300	**5,150**
8	1	1,000	1,000	950	1,050	4,000	**4,000**
9	1	3,000	1,500	800	200	5,500	**5,500**
10	2	12,000	4,000	2,500	200	18,700	**9,350**
Total	25	152,500	122,300	71,350	2,325	348,475	

By dividing the number of votes for each party by the Threshold for that geographical constituency, we get the following results. Note that the quotient is not separated as in the earlier explanation, but it is used the same way. That is, the integer portion of the quotient is the number of seats initially allocated to each party, and the fractional portion is used to allocate any remaining seats.

Vote Quotients

Geo District	# of seats	Party A		Party B		Party C		Party D	
		Votes	Quotient	Votes	Quotient	Votes	Quotient	Votes	Quotient
1	2	3,000	**1.22449**	1,000	**0.408163**	800	**0.326531**	100	**0.040816**
2	2	6,000	**1.25261**	2,000	**0.417537**	1,500	**0.313152**	80	**0.016701**
3	3	25,000	**1.363141**	20,000	**1.090513**	10,000	**0.545256**	20	**0.001091**
4	7	60,000	**2.797762**	50,000	**2.331468**	40,000	**1.865175**	120	**0.005596**
5	2	12,000	**0.766896**	11,000	**0.702988**	8,000	**0.511264**	295	**0.018853**
6	3	25,000	**1.269895**	28,000	**1.422282**	6,000	**0.304775**	60	**0.003048**
7	2	5,500	**1.067961**	3,800	**0.737864**	800	**0.15534**	200	**0.038835**
8	1	1,000	**0.25**	1,000	**0.25**	950	**0.2375**	1,050	**0.2625**
9	1	3,000	**0.545455**	1,500	**0.272727**	800	**0.145455**	200	**0.036364**
10	2	12,000	**1.283422**	4,000	**0.427807**	2,500	**0.26738**	200	**0.02139**

Using these quotients, we get the following allocation. (The columns showing "+ 1" indicate that an additional seat is allocated to that party based upon the fractional remainders.)

Geographical Seats Allocated

Geo District	# of seats	Party A Quotient	Party A Seats	Party B Quotient	Party B Seats	Party C Quotient	Party C Seats	Party D Quotient	Party D Seats
1	2	1.22449	1	0.408163	0 + 1	0.326531		0.040816	
2	2	1.25261	1	0.417537	0 + 1	0.313152		0.016701	
3	3	1.363141	1	1.090513	1	0.545256	0 + 1	0.001091	
4	7	2.797762	2 + 1	2.331468	2	1.865175	1 + 1	0.005596	
5	2	0.766896	1	0.702988	0 + 1	0.511264		0.018853	
6	3	1.269895	1	1.422282	1 + 1	0.304775		0.003048	
7	2	1.067961	1	0.737864	0 + 1	0.15534		0.038835	
8	1	0.25		0.25		0.2375		0.2625	0 + 1
9	1	0.545455	0 + 1	0.272727		0.145455		0.036364	
10	2	1.283422	1	0.427807	0 + 1	0.26738		0.02139	
Total	25		11		10		3		1

Allocation of National Top-Off Seats

National top-off seats are allocated by applying the Hare formula, using the total number of votes nationwide, divided by 65 seats. For each party, the number of geographical constituency seats won is then subtracted from the number of seats allocated at the national level, and the result is the number of "national top-off seats" awarded to that party.

It is possible that using this method may result in allocation of more than 65 seats, as illustrated below. In this continuation of our example, we use a Threshold of 5,361 votes, and divide the number of votes for each party by this threshold, giving us the results in the "Vote/Quotient" line of the table below. The integer portion of our quotient gives 28 seats to Party A, 22 seats to Party B, and 13 seats to Party C, for a total of 63 seats. The two remaining seats are allocated on the basis of fractional remainders to Party B and Party A.

The problem comes when we subtract the number of seats won at the geographical constituency level. Party D won a single seat in District # 8. However, the party did not have a sufficient number of votes at the national level to be awarded a seat. The end result is that we have now allocated 66 seats.

National Top-off Seats

Total Votes	Seats	Per Seat
348,475	65	5,361

	Party A		Party B		Party C		Party D		
Vote/Quotient	152,500	28.44537	122,300	22.81225	71,350	13.3087	2,325	0.433675	
Allocated		28 + 1		22 + 1		13		0	65
Less Geographical Allocation		11		10		3		1	25
Top-off Seats Allocated		18		13		10		0	41

Proposed Solution

The easiest solution to this problem would be to clarify at the onset that the allocation of seats will stop when 65 seats have been allocated. Seats awarded on the basis of "integer division" would be awarded, and subtracted from the seats won within the geographical constituencies. This subtraction should occur before awarding any seats based upon fractional remainders. The number of seats awarded based upon fractional remainders would be 65 minus the number of seats already allocated.

Continuing the above example, we would award the seats based upon integer division as follows.

	Party A	Party B	Party C	Party D
Geographical Seats	11	10	3	1
Awarded by Integer Division	28	22	13	0
Total seats awarded before using fractional remainders	28	22	13	1

The total number of seats awarded thus far is 64, leaving one additional seat to be awarded, based upon highest remainder. The seat goes to Party B, based upon the remainder of .81225.

Unfortunately, this does not resolve the problem in every potential case. With a large number of parties, and with some parties contesting only 6 districts (the minimum legal requirement to appear on a ballot), it is possible that more than one party may win a seat at the geographical district level, but have an inadequate number of votes to win at the national top-off level. In a case where the number of seats allocated by integer division alone, minus the seats won at the district level, still gives a result of greater than 65 seats, the divisor decremented by 1 (divide total votes / 64), and the allocation re-calculated. If this still results in allocation of too many seats, the divisor should be decremented by 1 again (total votes / 63), and the allocation re-calculated.

Appendix G – Memos Explaining Discrepancy in Reported # of Voters

Memo 1 – From Technical Oversight Committee

Memo 2 – From Michael Yard, IFES

PRELIMINARY INVESTIGATIONS INTO APPARENT TRANSACTED MRCS WITHOUT NEWPHOTOTAKEN FLAG

(Also included: Illustration (p.4) and Software Extract (p.5))

Executive Summary

1. A software error in a reporting tool meant that the reported figures for Photographic transactions and overall transacted MRC's differed by over 18,000.
2. The error was investigated and identified and has been rectified.
3. The data in the Master Registration Database was, at all times, correct.
4. Only the transaction summary reports were inaccurate.
5. The error did not cause any elector to be wrongly included or excluded in the RVL or any other statutory list output from the MRDB.

The Problem

A reported difference of over 18,000 between MRC's with NewPhotoTaken transactions and MRC's transacted overall, the latter being the larger figure.

The Investigation

Efforts to investigate this problem took place at the same time as preparations were being made to product the RVL Snapshot. Preliminary tests of the query to produce said RVL Snapshot resulted in a number of records some 18,000 larger than the figure predicted by the Summary of Transactions reports provided by the Reporting Tool.

A careful re-examination of the RVL criteria and query confirmed that the higher figure was correct. This suggested that the error lay in the reporting tool. Careful examination of the tool resulted in the discovery of a software error in the code therein.

Further investigations confirmed that the error existed only in the reporting tool and that the data in the MRDB was correct at all times.

The investigation was carried out by GECOM ISD ISO (Arun Mangar), Analyst Programmer (Andrew Chung), ToC (Ronan McDermott, Daniel Fung, Andrew Mancey) with inputs from GECOM SCIS and IFES (Michael Yard).

The Fault – in detail

The Reporting Tool built to deliver running Summaries of Transactions during Claims & Objections operates as follows:

(1) Every MRC in the Main Registration Database is copied to a table in the Reporting Rool called mrcdetails. This is done so that reporting can be done offline to prevent degradation of server performance with corresponding loss in ISD productivity.

(2) A check is made in the PVL for the MRC. If it is **found**, each field in the PVL record is compared with the corresponding field in the MRDB record and the mrcdetails record is appropriately flagged (Photographic, Transfer, Correction).

(3) If it is **not found**, it is assumed to be a New Entry and is flagged New Entry in the mrcdetails table.

(4) When reporting from mrcdetails, counts are made of the Photograpic, Transfer, Correction and New Entry flags, by District.

(5) Ideally, the total of Photographic flags should equal the total of MRC's transacted.

The error in this reporting mechanism is that New Entry records in mrcdetails are NOT flagged as Photographic and they are therefore EXCLUDED from the count of Photographic transactions. (See Attached extract from Reporting Tool Software).

It is important to stress that the NewPhotoTaken flag was correctly set in the Main Registration Database for all New Entries. The error exists in the logic of the reporting tool which misreported New Entries due to incorrect flagging there.

Since the data entry for New Entries was the <u>last</u> activity undertaken by ISD, the numbers of Photographic transactions and MRC's Transacted (which had been converging), moved further apart (as observed).

When the GECOM criteria for the RVL Snapshot were applied to the Main Registration Database, the resultant number of records correctly included New Entry records and were greater than the number reported by the flawed reporting tool.

The Solution

Technically, add a line of code to the Reporting Tool to correctly flag as nForm3 (ie NewPhotoTaken) any MRC code identified as New Entry.

From a management perspective, it is vital to develop applications within a timeline which offers sufficient opportunities to test.

Illustration

MRDB

Main Registration
Database

Snapshot Taken using GECOM Criteria

RVL
Snapshot

Nightly Copy of MRDB Data for Analysis

In the MRDB, all New Entry
records are correctly flagged with
NewPhotoTaken. All outputs from
MRDB (such as the RVL
Snapshot) contain the correct
number of records.

In the reporting tool mrcdetails table,
all New Entry records are NOT
flagged Form3 (New Photo Taken).
All reports prepared therefore
misreport Photographic numbers and
will show incorrect ratio of
Photographic Transactions to MRC's
Transacted.

mrcdetails
Reporting
Tool

Output, by District and Transaction Type

Summary Report of
Claims & Objections
Transactions Processed*

*Sample attached

```
┌─────────────────────────────────────────────────────────┐
│ Extract from the software used in the Reporting Tool     │
│ (supplied by GECOM/ISD 26/Jan/01)                        │
└─────────────────────────────────────────────────────────┘
```

```
LOCAL nForm3, nForm5, nForm8, nForm7, cDivSubId, nMRCCode, nNumberDone, nRecTotal, nTransCountID
rForm3      = 0
nForm5      = 0
nForm8      = 0
nForm7      = 0
nMRCCode    = 0
nNumberDone = 0
nRecTotal   = 0
nTransCountID = 0
* Disable Process Button & Close button
this.enabled = .f.
ThisForm.EXITFORM1.enabled = .f.
nRecTotal    = RecCount("MRDB_SnapShot")


Select MRDB_SnapShot
Scan
    Select MRDB_SnapShot
    nNumberDone = nNumberDone + 1
    ThisForm.oleProgress.value = (nNumberDone/nRecTotal) * 100
    ThisForm.txtTransNumber.value = nNumberDone

    cDivSubID = Alltrim(MRDB_SnapShot.DivisionID)+IIF(IsNull(MRDB_SnapShot.SubDivision),'',MRDB_S
napShot.SubDivision)
    nMRCCode = MRDB_SnapShot.MRCCode)
    =Requery("PVL2000_SnapShot")
    If RecCount("PVL2000_SnapShot") > 0

        * Form 5
        If Alltrim(Upper(PVL2000_SnapShot.SubDivision)) <> Alltrim(Upper(MRDB_SnapShot.SubDivisio
n)) or ;
           Alltrim(Upper(PVL2000_SnapShot.DivisionId))  <> Alltrim(Upper(MRDB_SnapShot.DivisionID
))
            nForm5 = 1
        EndIf

        * Form 8 Part 1
        If Alltrim(PVL2000_SnapShot.Surname)    <> Alltrim(MRDB_SnapShot.Surname) or ;
           Alltrim(PVL2000_SnapShot.FirstName)  <> Alltrim(MRDB_SnapShot.FirstName) or ;
           Alltrim(PVL2000_SnapShot.MiddleName) <> Alltrim(MRDB_SnapShot.MiddleName) or ;
           PVL2000_SnapShot.DateOfBirth         <> MRDB_SnapShot.DateOfBirth or ;
           Alltrim(PVL2000_SnapShot.Occupation) <> Alltrim(MRDB_SnapShot.Occupation) or ;
           Alltrim(PVL2000_SnapShot.Sex)        <> Alltrim(MRDB_SnapShot.Sex)
            nForm8 = 1
        EndIf

        * Form 8 Part 2
        If Alltrim(PVL2000_SnapShot.DivisionID)    == Alltrim(MRDB_SnapShot.DivisionID) and ;
           Alltrim(PVL2000_SnapShot.SubDivision)   == Alltrim(MRDB_SnapShot.SubDivision)
            If Alltrim(PVL2000_SnapShot.LotNumber) <> Alltrim(MRDB_SnapShot.LotNumber) or ;
               Alltrim(PVL2000_SnapShot.StreetName) <> Alltrim(MRDB_SnapShot.StreetName)
                IF nForm8 = 0
                    nForm8 = 1
                Endif
            EndIf
        EndIf

        * Form 3
        If MRDB_SnapShot.NewPhotoTaken = .T.
            nForm3 = 1
        Endif

    Else
        * Form 7
        nForm7 = 1
    Endif
*!*     =Requery("TransCount")
*!*     If RecCount("TransCount") > 0
*!*         nTransCountID = TransCount.TransCountID
*!*         Replace TransCount.Form3_Trans with TransCount.Form3_Trans + nForm3 in TransCount
*!*         Replace TransCount.Form5_Trans with TransCount.Form5_Trans + nForm5 in TransCount
```

```
┌─────────────────────────────────────────────┐
│ The software error lies in this piece of      │
│ code. The error (technically, it's an         │
│ omission) lies in the failure to set          │
│ nForm3 = 1 for New Entry records.             │
│ The error will be corrected by adding the     │
│ line                                          │
│              NForm3 = 1                        │
│                                               │
│ after the indicated line.                     │
└─────────────────────────────────────────────┘
```

Software Extract

Memorandum

To: Maj. Gen. Joe Singh, Chairman GECOM

CC:

From: Michael Yard, IFES

Date: 2/12/01

Re: Discrepancy in number of registered voters

The GECOM Technical Oversight Committee (TOC) has reported on its investigation into an apparent discrepancy between the number of MRCs and the number of photos. The discrepancy seemed to indicate that there were approximately 18,000 MRCs without corresponding photos. As explained in the TOC report, the problem was not in the process of Claims and Objections, or in the handling of forms, or even in the final data. The problem existed only in a reporting tool due to a failure of that tool to report photos taken for all new registrants. The only thing I would like to add to that report is a detailed step-by-step example to illustrate as clearly as possible how the reporting tool failed.

The first step in the reporting process was to make a snapshot of data, and the reporting tool then performed all its operations on this snapshot, using the following logical steps (The missing step is identified in bold):

```
ITERATE THROUGH ALL ROWS OF DATA IN THE MUNICIPAL RECORDS
DATABASE. FOR EACH ROW OF DATA (ONE REGISTRANT), DO THE
FOLLOWING:

     1. LOOK FOR A MATCHING RECORD IN THE PVL DATABASE.
     IF A MATCHING RECORD IS FOUND, DO THE FOLLOWING

           2. CHECK TO SEE IF A NEW PHOTO WAS TAKEN. IF SO,
           INCREMENT THE COUNT FOR "Photographic"

           3. CHECK TO SEE IF THIS WAS A TRANSFER. (CHANGE TO
           DIVISION OR SUBDIVISION). IF SO, INCREMENT THE COUNT
           FOR "Transfer"

           4. CHECK TO SEE IF THIS WAS A CORRECTION (CHANGE TO
           NAME, DATE OF BIRTH, ADDRESS, OCCUPATION, ETC.). IF
           SO, INCREMENT THE COUNT FOR "Correction"

      5. IF NO MATCHING RECORD IS FOUND, INCREMENT THE COUNT FOR
      "New Entry"

REPEAT FOR THE NEXT ROW OF DATA
```

To illustrate, the reporting system is completing the following table of information:

Number of transactions of each type:

Photographic	
Transfer	
Correction	
New Entry	

If we follow the logic through a sample MRDB that includes the following rows of data, the logical error becomes clear:

MRC #	Transaction Type	Photo Taken?
1	Transfer	Yes
2	Correction	Yes
3	New Entry	Yes

We begin with MRC # 1. Step 1 is to look for a matching record in the PVL. Since this is a Transfer, we will find a match. Step 2 checks to see if photo was taken, and increments the count for "Photographic" to 1. Step 3 finds that this is a Transfer, and increments the count for "Transfer" to 1. Step 4 – this is not a Correction so no action is taken. Since a match was found in Step 1, Step 5 is not carried out. Our table is now updated to:

Photographic	1
Transfer	1
Correction	
New Entry	

Moving to MRC #2. Step 1 looks for a match. Since this is a Correction, we will find a match. Step 2 checks to see if photo was taken, and increments the count for "Photographic" "2". Step 3 – this is not a Transfer so no action is taken. Step 4 – since this is a Correction, we increment our count for "Correction" to 1. Since a match was found in Step 1, Step 5 is not carried out. Our table now shows:

Photographic	2
Transfer	1
Correction	1
New Entry	

Finally, we evaluate MRC # 3. Step 1 looks for a match. Since this is a new registration, there will be no matching record in the PVL. Because no match is found, we skip Steps 2 to 4. Step 5 increments our count for "New Entry", giving us:

Photographic	2
Transfer	1
Correction	1
New Entry	1

A report is now generated showing that the total number of MRCs is 3, while the total number of photos taken is 2. To correct the logical error in programming, we must change the order of Step 1 and Step 2, checking to see if a photo is taken for all MRC's, not only for those that have a matching record in the PVL. This is documented in the code attached to the TOC report.

APPENDIX H – How the Voter List is Constructed
(recommended PR publication)

```
┌─────────────────────┐        ╭─────────────╮         ┌─────────────────────┐
│ MRDB from 1996      │───────▶│ Minus deaths,│────────▶│ NRR, PVL Oct. 2000  │
│ 526,000 names       │        │ emigrants,   │         │ 516,000 names       │
└──────────┬──────────┘        │ successful   │         └─────────────────────┘
           │                   │ objections   │
           │                   ╰─────────────╯
           ▼
┌─────────────────────┐
│ MRDB Oct. 2000      │
│ 516,000 names       │
└──────────┬──────────┘
           │
           ▼
       ╭────────────────────────╮
       │ Claims & Objections,   │
       │ New Registration,      │
       │ Transfers, Corrections │
       ╰───────────┬────────────╯
                   │
                   ▼
┌─────────────────────┐        ╭─────────────╮         ┌─────────────────────┐
│ MRDB 2001           │───────▶│ Minus deaths,│────────▶│ Revised Voter List  │
│ 532,000 names       │        │ emigrants,   │         │ Jan. 2001           │
└─────────────────────┘        │ successful   │         │ 433,478 names       │
                               │ objections   │         └─────────────────────┘
                               ╰─────────────╯
```
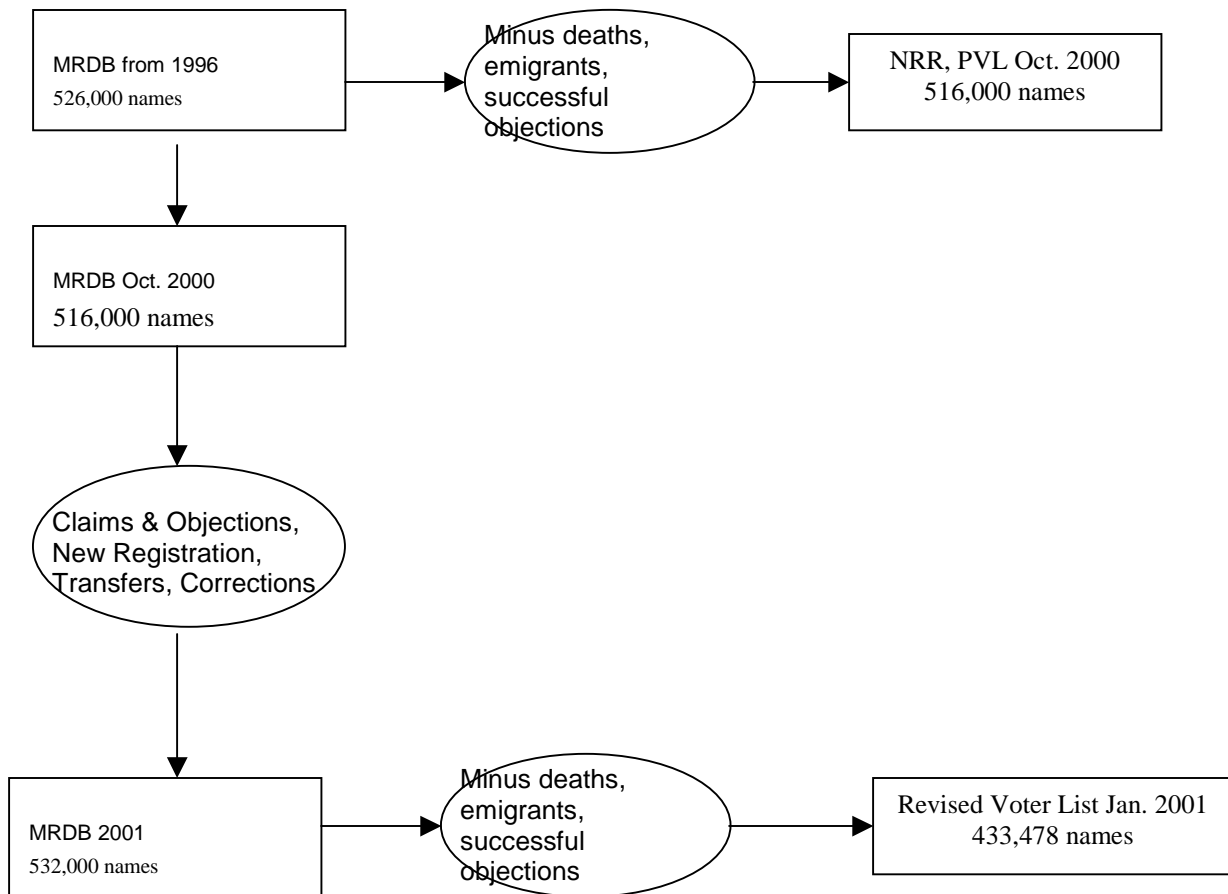
1. Master Records Database (MRDB) from 1996 elections contains 526,000 names. This includes everyone registered before this date, whether or not the person is eligible to appear on the voters list. For example, when someone is reported deceased or emigrated, the name is not removed from the list, but is marked so that it will not appear on the voters list. Keeping the record in the MRDB prevents any other person from using the name of the deceased or emigrant to register fraudulently.
2. National Register of Registrars (NRR) and Provisional Voters List (PVL) are printed reports listing all names in the MRDB except those reported deceased, emigrated to another country, or rejected during previous Claims and Objections. This report is distributed to political parties for their scrutiny (NRR), and posted for Claims and Objections (PVL). This reduced list becomes the new MRDB for 2001.
3. MRDB as of Jan. 2001 contains 532,000 names, indicating that approximately 16,000 new registrations were received during the period of Claims and Objections. This MRDB also has been updated with transfers and corrections, and with new photographs.
4. The Revised Voter List (RVL) is a report listing all names in the MRDB except those reported deceased, emigrated to another country, or rejected during Claims and Objections. In addition to the names currently on the RVL, there were 6,138 incomplete transactions during the Claims and Objections period. These names include, among others, some who completed a Transfer Form, but were never registered to begin with, and persons who did not return to have a photo taken. GECOM, with cooperation of the political parties continues to investigate these cases.